Amendments to the Specification:

Paragraph beginning on page 1, line 5

The subject matter of the present application is related to and may be advantageously combined with the subject matter of copending and commonly owned application U.S. ~~Patent~~ Application Serial No. 09/616,161, to Yakhnich et al, filed July 14, 2000, entitled "Method of Channel Order Selection and Channel Order Estimation in a Wireless Communication System," incorporated herein by reference in its entirety.

Paragraph beginning on page 2, line 19

The bits output of the encoder are then interleaved wherein the order of the bits are changed so as to more efficiently combat error bursts. The rearrangement of the bits caused by interleaving improves the resistance to error bursts ~~while adding~~ <u>but add</u> latency and delay to the transmission.

Paragraph beginning on page 3, line 17

The output of the symbol to bit mapper is then input to a bit de-interleaver 26 which functions to restore the original order of the bits. The bits are then input to an outer decoder 29 which functions to locate and fix errors using the redundancy inserted by the encoder. The outer decoder generates the binary receive data a_k ~~17~~ <u>28</u>.

Paragraph beginning on page 4, line 12

The problem is illustrated when considering a receiver adapted to handle a GSM Enhanced General Packet Radio System (EGPRS) signal. Such a system utilizes a bit wise interleaver and punctured convolutional coding for performing Forward Error Correction (FEC) over channels that require equalization. Assume that the equalizer [[used]] employs a Soft Output Viterbi Algorithm in its operation and that the outer FEC decoder employs the Viterbi Algorithm. After de-interleaving, the soft symbol decision information output of the equalizer is no longer related to the bits output of the de-interleaver.

Paragraph beginning on page 4, line 19

A prior art technique for generating soft bit decisions is described in "A Soft-Decision State-Space Equalizer for FIR Channels," J. Thielecke, IEEE Transactions on Communications, Vol. 45, No. 10, October 1997. A nonlinear equalizer is described that is intended for FIR channels which is based on a state-space description of the channel. The algorithm utilizes equations that resemble a Kalman hard ~~decisions~~ <u>decision</u> feedback equalizer ~~wherein~~ <u>whereby</u> the probability estimates of the received bits are incorporated.

Paragraph beginning on page 4, line 25

A disadvantage of this prior art technique is that the level of computational complexity is relatively high making implementation difficult ~~to implement~~ in communication systems. In addition, the technique is restricted to a particular type of channel and a particular way of describing the channel.

Paragraph beginning on page 5, line 9

The invention is adapted to receive M soft symbol values where each symbol represents m bits ($M = 2^m$). Alternatively, M-1 soft ~~symbol~~ symbols are input wherein the M^{th} symbol is a reference symbol that is implied. A sub-optimal implementation of the invention is adapted to receive fewer than M soft symbol decisions. The output for each symbol comprises m soft values of bits representing the symbol. The invention is operative to convert the soft symbol values to soft bit values using the log likelihood ratios (LLRs) of a bit and a symbol expressed as conditional probabilities. As shown by simulations, the method of the invention provides for improved performance of several dBs.

Paragraph beginning on page 5, line 21

The method of the invention is presented which can be performed in either hardware or software. A computer comprising a processor, memory, etc. is operative to execute software adapted to perform the soft symbol to soft bit conversion method of the present invention.

Paragraph beginning on page 11, line 18

A block diagram illustrating a concatenated receiver incorporating a soft decision symbol to bit converter constructed in accordance with the present invention is shown in Figure 2. The communication system, generally referenced 30, comprises a concatenated encoder transmitter 32 coupled to a channel 42, and a concatenated decoder receiver 50 also coupled to the channel. The transmitter 32 comprises an encoder 34, bit to symbol mapper 36 and modulator 38. Input data bits to be transmitted are input to the encoder 34 which may comprise an error correction encoder such as Reed Solomon, convolutional encoder, parity bit generator, etc. The encoder functions to add redundancy bits to enable errors in transmission to be located and fixed.

Paragraph beginning on page 12, line 1

The symbols output from the mapper are input to the modulator 38 which functions to receive symbols in the M-ary alphabet and to generate the analog signal therefrom that is subsequently transmitted over the channel 42. The channel may comprise a mobile wireless channel, e.g., cellular, cordless, fixed wireless channel, e.g., satellite, or may comprise a wired channel, e.g.,

xDSL, ISDN, Ethernet, etc. It is assumed that noise is present and gets added to the signal in the channel. The transmitter is adapted to generate a signal that can be transmitted over the channel so as to provide robust, error free detection by the receiver.

Paragraph beginning on page 12, line 18

Note that the equalizer may be adapted to output soft symbol values, e.g., a SOVA or MAP based equalizer. Alternatively, it may be adapted to output hard symbol decisions, e.g., a maximum likelihood sequence estimation (MLSE) based equalizer that utilizes the well known Viterbi Algorithm (VA), linear equalizer and decision feedback equalizer (DFE). In this case, soft decisions must be generated from the hard decisions. A technique for generating the soft decisions is described in U.S. Patent No. 5,457,704 to Hoeher et al., entitled "Post Processing Method and Apparatus for Symbol Reliability Generation," incorporated herein by reference in its entirety. Another suitable soft symbol generation technique is described in ~~U.S Application Serial No. X~~ U.S. Patent No. 6,731,700 , to Yakhnich et al., ~~filed X,~~ entitled "Soft Decision Output Generator," incorporated herein by reference in its entirety.

Paragraph beginning on page 13, line 3

The MLSE technique is a nonlinear equalization technique which is applicable when the radio channel can be modeled as a Finite Impulse Response (FIR) system. Such a FIR system requires knowledge of the channel impulse response tap values. The channel estimate is obtained using a known training symbol sequence to estimate the channel impulse response. Other equalization techniques such as DFE or linear equalization require precise knowledge of the channel.

Paragraph beginning on page 18, line 8

The process of summing the ~~symbols~~ symbol log likelihood ratios for the zero and one and subsequently computing the bit LLR is repeated for each bit position (step 88). The resultant bit LLRs are subsequently output to the soft outer decoder (step 90).

Paragraph beginning on page 18, line 17

To aid in illustrating the approximation soft bit method of the present invention, the diagram in Figure 5 is provided that illustrates the symbol mapping of modulating bits and their arrangement into bit groups for [[a]] an 8-PSK symbol as used in GSM EDGE systems. The symbol mapping diagram, generally referenced 100, is divided according to bit position. Dashed line 102 divides the 8 symbols into a group in which the MSB=0 and a group in which the MSB=1. Dashed line 104 divides the 8 symbols into a group in which the mid bit or Second Significant Bit (SSB)=0 and a

group in which the mid bit=1. Dashed lines 106 divide the 8 symbols into a group in which the LSB=0 and a group in which the LSB=1.

Paragraph beginning on page 20, line 15

where n represents the second largest soft symbol after the maximum. Due to the rapidly increasing exponential functions in the expression for the bit LLR, the maximum symbol value is by far the most ~~dominate~~ dominant probability and the remaining $\frac{M}{2}-1$ soft symbol values can be ignored. Therefore, the following approximation is valid (step 116)

Paragraph beginning on page 20, line 20

Thus, the maximum symbol values are [[is]] substituted for the zero-symbol and one-symbol sums. Substituting Equation 12 into Equation 10 yields

Paragraph beginning on page 21, line 5

A flow diagram illustrating the calculation of soft decision bit information using the second soft decision symbol to bit method of the present invention is shown in Figure 7. The symbol log likelihood ratio values are organized into groups according to bit position, in similar fashion to the optimal method described above in connection with Figure 4 and as shown in Table 1 (step 120). Note that this method assumes that all the soft symbol values for a symbol are received from the equalizer.

Paragraph beginning on page 21, line 11

For each of the m bit positions, the maximum soft symbol value from among the symbols whose bit of interest equals zero is determined (step 122). Likewise, the maximum soft symbol value from among the symbols whose bit of interest equals one is also determined (step 124). The log likelihood ratio for the particular bit is computed using the two maximum soft symbol values (step 126). A bit log likelihood ratio value is computed for each bit of the symbol (step 128). The resultant bit LLRs are subsequently output to the soft outer decoder (step 130).